Researchers find renewable energy leftovers could fertilize, cut carbon emissions

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(PhysOrg.com) -- For hundreds of years, farmers in Brazil's Amazon Basin have hunted through dense jungles for what is called "terra preta" — mysterious plots of super-fertile black soil amid otherwise nutrient-stripped earth.

In recent decades, researchers have discovered that the rich properties of terra preta stem from the carbon-heavy leftovers of ancient cooking sites. Now, University of Florida researchers have found we can make our own version of the soil's potent component, a form of charcoal dubbed biochar, from the remnants of renewable fuel production.

"This could possibly improve the viability of certain biofuels by giving a valuable — both economically and environmentally - byproduct from material that would otherwise just be a disposal problem," said Bin Gao, an assistant professor of agricultural and biological engineering at UF's Institute of Food and Agricultural Sciences.

For example, a renewable form of natural gas can be produced by "digesting" organic material with the help of added bacteria. As they report in the November issue of the journal *Bioresource Technology*, Gao and a team from UF found that, using inedible portions of sugar cane as feedstock, the sludge material left over from this process can then be turned into useful forms of biochar.

The biochar is created through a process called flow pyrolysis, in which plant matter is broken down by exposure to temperatures up to 650

degrees Fahrenheit in a container without much oxygen. This means the carbon-heavy components of the material can't burn, but are freed up in the blackened leftovers.

Whereas the leftovers from the biofuel production would normally need to be treated and disposed of as waste material, biochar can instead be used to augment infertile soil by absorbing pollutants, leveling acidity, improving water retention and reducing the leaching of nutrients.
Biochar has another important property — it can be used to sequester carbon and thus reduce emissions that contribute to the greenhouse effect.

"When you add biochar to the soil, it's likely that as much as 90 percent of that carbon is still going to be in that soil a hundred years from now if left undisturbed," said Andrew Zimmerman, UF assistant professor of geological sciences and co-author of the study.
Some studies have indicated that converting all agricultural waste biomass to biochar could reduce carbon emissions by as much as 12 percent, Zimmerman said.

Biochar production can be integrated with other methods of producing biofuels. But more study is needed to understand how to produce biochar suitable for agricultural use, the researchers say.

Provided by University of Florida